



# PATENT SPECIFICATION

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## COMPLETE SPECIFICATION.

### Improvements in or relating to Monofilament Synthetic Yarns, Strands or Strips and Fabrics Woven therefrom.

Communication from THE FIRESTONE TIRE & RUBBER COMPANY, a company incorporated under the laws of the State of Ohio, United States of America, of Main Street, and Cole Avenue, Akron, State of Ohio, United States of America.

I, ARTHUR HAROLD STEVENS, a British Subject, of the Firm of Stevens, Langner, Parry & Rollinson, Chartered Patent Agents, of 5/9 Quality Court, Chancery Lane, London, W.C.2, do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

This invention relates to improvements in synthetic monofilament upholstery yarns, strands, or strips and to upholstery fabrics woven from such mono-filaments, composed of materials commonly known as "plastics".

The principal object of the invention is to devise a mono-filament strand or strip having an advantageous cross-sectional configuration, and a fabric woven from such strands or strips.

A further object of the invention is to provide novel, interstitial fabric structures woven from mono-filament plastic yarns, strands, or strips, said fabric being resiliently flexible, non-stretchable, non-inflammable, durable, abrasion resistant, moisture and acid proof, unaffected by dry cleaning solvents, porous, bright and lustrous.

Another object is to provide a novel plastic fabric woven from mono-filament yarns, strands, or strips, which are pliable, non-splintering, tough, non-porous, and having a high tensile strength and high fatigue limit.

A still further object of this invention is to provide a comparative lightweight woven fabric, the weave of which forms a multiplicity of freely open, unfilled interstices throughout its area, so that said fabric is efficiently air pervious; which fabric is composed of interwoven strands of a non-inflammable highly flexible and non-absorptive hardened plastic compound comprising a basic co-polymeric resin and a plasticizer,

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and which may include desired coloring pigment, dyes, or other coloring matter.

In accordance with this invention there is provided a mono-filament upholstery yarn strand or strip having one convex surface and one concave plane surface and consisting essentially of vinylidene chloride polymer or of a co-polymer thereof and another polymerizable vinyl compound.

The invention also resides in an improved upholstery fabric woven from the mono-filament yarns, strands or strips of the invention.

In order that the invention may be clearly understood and readily carried into effect, the same will now be described more fully with reference to the accompanying drawings, in which:

Fig. 1 is a plan view of a coarse woven fabric embodying this invention; and Figure 2 is a sectional view therethrough taken on line 2—2 of Figure 1.

Figure 3 is an enlarged detail cross section of a coarse strand or strip, of which the fabric illustrated in Figure 1 is composed;

Figure 4 is an enlarged detail cross section of a coarse strand or strip similar to that illustrated in Figure 3, but having a modified cross sectional form.

Similar characters of reference are employed in the above described views, to indicate corresponding parts.

The class of materials employed in the manufacture of the novel fabric claimed herein are polymeric or co-polymeric resins in combination with suitable plasticizers and stabilizers, with which may be incorporated suitable coloring pigments, dyes, or other coloring material, as desired. The resins are derived from the polymerization of vinylidene chloride either alone or conjointly with one or more compounds selected from a group which consists of the vinyl halides (of which vinyl chloride is typical), the lower aliphatic esters of vinyl alcohol (of which vinyl acetate is typical), the lower aliphatic esters of methacrylic and acrylic acids (of which methyl methacrylate and ethyl acrylate are typical), and styrene together with its nuclear substituted chlor-

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ine derivatives (of which styrene and meta chlorstyrene are typical).

To make the material more readily extrudable and ductile, suitable plasticizers and/or stabilizers are added as well known in the art of vinylidene chloride plastics. The material is then extruded through a die to a cross sectional contour providing one convex surface and one concave or plane surface, and is then drawn by elongating the extruded strip, while still in a plastic state, to reduce the cross sectional dimension of the strip to the desired size. This drawing action results in an orientation of the fibers or crystals of the material. Vinylidene chloride possesses a degree of fibrous crystallinity. Normally, these crystals lie in a random, heterogeneous arrangement, in which condition the plastic is found to have physical properties in the ordinary range of other thermoplastic materials known in the prior art, as set forth above. Partially by the extrusion, and more completely by the drawing and orientation, the fibrous crystals are re-aligned in an orderly linear pattern. When such an extruded, oriented plastic strand is stressed, each crystal theoretically assumes its share of the load and the more desirable physical properties enumerated in the objects above are attained. An important characteristic of the plastic strand or filament thus manufactured is that its desirable qualities, particularly its pliability, are unaffected by all ordinary atmospheric temperature changes. The material thus produced has an unusually high tensile strength. Even large size filaments may thus be produced, having a tensile strength of 60,000 lbs. per sq. in., as well as having great flex life and high fatigue limit. The strands or strips of mono-filaments, so manufactured, are pliable, non-splintering, tough, and non-porous. Preferably, after the strip is extruded, and after it is oriented, the strip is immersed in a water bath to set up and cool the plastic forming the strip.

After extrusion and orientation the filament is allowed to cool and harden and is ready for weaving. The weaving of coarse strips or strands may be carried out on ordinary cane or rattan looms. Wetting of the strands to promote flexibility is avoided, since the material is sufficiently pliable in its natural state, as distinguished from rattan, which must be moistened to render it sufficiently pliable for weaving.

When such mono-filament yarns, strands, or strips are woven, they produce a fabric which is resiliently flexible, non-stretchable, non-inflammable, durable, abrasion resistant, moisture and acid proof, unaffected by dry cleaning solvents, porous, bright and lustrous. The weave of the material is

such that a multiplicity of freely open unfilled interstices are produced throughout its area, so that the fabric is efficiently air pervious, a property which is highly desirable in the manufacturing of seat cushion coverings, furniture, and screens. This property may also be utilized in manufacturing the fabric into women's shoes and hats.

Referring now to the drawings in detail, Figure 1 illustrates a coarse fabric 10 embodying the invention, for example, a fabric simulating woven rattan, suitable for seat covering for railway trains, automobile side paneling, furniture covering, automobile seats, and other transportation seating. The mono-filament strips or strands 11 in this fabric may have a plano-convex cross section, as illustrated in Figure 2 of the drawing. In order to make the fabric more resiliently flexible, however, it is preferred that the cross section of strand 11 be made concavo-convex, as illustrated in Figure 4 of the drawings. The fabric is preferably woven with all of the yarns, strands or strips positioned with their convex surfaces on the outer side of the fabric.

The yarns may be made in sizes from a few thousandths of an inch to one sixteenth inch or larger, according to the type and gauge of fabric to be manufactured. Many different effects may be obtained by plain weaves with various colors, or by solid colors or variegated colors in other types of weaves, such as close weaves and box, twill, drill, and sateen weaves, in addition to the satin weave illustrated in the drawing. Many striped, checkered, and barred effects can be produced by weaving various colors. Intricate patterns and simulated embroidery designs can be produced by weaving the material on a Jacquard loom. The latter materials are suitable for the upholstery of automobiles, furniture, draperies, curtains, and the like.

Such fabric is stainless, non-inflammable, non-splintering, non-shrinkable, poorly heat conductive, and moisture and acid proof, while at the same time being highly resistant to abrasives, cutting, or like effects, whereby it is very durable, resistant to destruction, and therefore greatly resistant to either willful or accidental injury. By reason of its moisture and acid proof characteristics, and resistance to all common solvents, especially those used for dry cleaning, such novel covering fabric is readily subject to thorough cleaning with water and common cleaning compounds or solutions without risk of injury thereto.

Furthermore, by reason of the ability to incorporate in the material of which it is composed, coloring matter of any desired color, the novel fabric is easily subject to production in selected solid or variegated colors, to the enhancement of the appear-

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ance and attractiveness of the environment in which the fabric is employed.

The fabric may be transparent, translucent, or opaque, and may be woven with an open or close weave, box weave, basket weave, or weaves having twill, satin, and Jacquard effects. The mono-filaments, strips, or strands may be glossy and smooth to make the fabric more readily locally deformable in cooperation with an underlying locally deformable cushion.

Fabrics woven from the coarser strips or strands are particularly applicable to furniture manufacture and seat coverings where it takes the place of reed, rattan, cane, and split bamboo materials formerly used, in which case the surface of the strands may be slightly ridged or corrugated to simulate the natural product. In this application, owing to the unlimited weaving and coloring effects, the use of this novel fabric is especially advantageous. Either simple one color, or more elaborate multi-color designs are readily produced in weaving, making material available for unusual, decorative, and aesthetic effects. The coarser woven material may be effectively utilized as a covering material for luggage, where its durability, attractive appearance, resistance to abrasion, and waterproof characteristics are especially advantageous.

In the finer mono-filament yarn sizes the fabric can be effectively woven with a satin or Jacquard figured weave suitable for finer furniture coverings, automobile seat coverings, draperies, curtains, and the like. This finer woven material is also suitable and highly effective for certain types of wearing apparel, such as ladies hats and shoes.

Having now particularly described and ascertained the nature of my said invention (as communicated to me by my foreign correspondents), and in what manner the same is to be performed, I declare that

what I claim is:

1. A mono-filament upholstery yarn, strand or strip having one convex surface and one concave or plane surface and consisting essentially of vinylidene chloride polymer or a co-polymer thereof and another polymerizable vinyl compound.

2. An upholstery yarn, strand, or strip according to claim 1, in which the vinylidene chloride is polymerized conjointly with one or more of the following compounds: vinyl halides, such as vinyl chloride; the lower aliphatic esters of vinyl alcohol, such as vinyl acetate; the lower aliphatic esters of methacrylic and acrylic acids, such as methyl methacrylate and ethyl acrylate; and styrene together with its nuclear substituted chlorine derivatives, such as styrene and meta chlorstyrene.

3. An upholstery fabric woven from yarns, strands or strips according to claim 1 or 2.

4. An upholstery fabric according to claim 3, in which the fabric is woven with all the yarns, strands or strips positioned with their convex surfaces on the outer surface of the fabric.

5. The improved mono-filament upholstery yarns, strands or strips, and the improved upholstery fabric woven therefrom, substantially as hereinbefore described with reference to the accompanying drawings.

Dated this 28th day of December, 1943.

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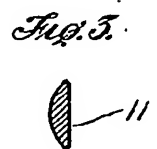
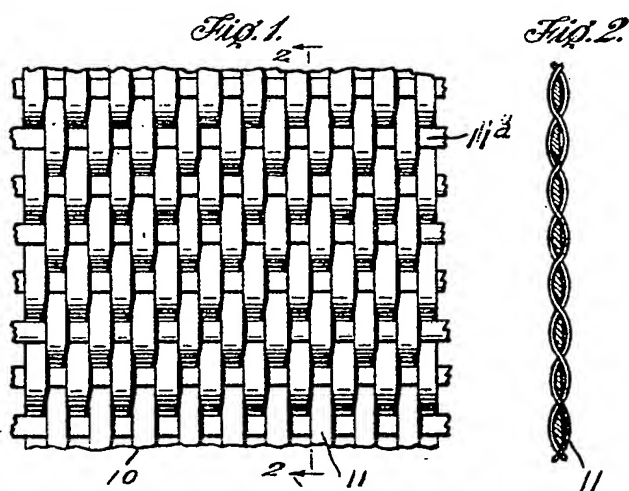
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[This Drawing is a reproduction of the Original on a reduced scale.]



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